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PATENT

Our Case No. 03093

APPLICATION FOR LETTERS PATENT OF THE

UNITED STATES OF AMERICA BY

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FOR:

CORDLESS STETHOSCOPE FOR HAZARDOUS MATERIAL ENVIRONMENTS

SPECIFICATION

TO WHOM IT MAY CONCERN:

BE IT KNOWN that KEITH A. SAUERLAND, a citizen of the United States and a resident of LINDENHURST, ILLINOIS, U.S.A. has invented a new

CORDLESS STETHOSCOPE FOR HAZARDOUS MATERIAL ENVIRONMENTS

and does hereby declare that the following is a full, clear and exact description, reference being had to the accompanying drawings and to the numerals of reference marked thereon, which form a part of this specification.

CORDLESS STETHOSCOPE FOR HAZARDOUS MATERIAL ENVIRONMENTS

BACKGROUND OF THE INVENTION

Field of the Invention

The claimed invention generally relates to stethoscopes. More specifically, the claimed invention relates to cordless or wireless stethoscopes.

Description of the Prior Art

The threat of rapidly spreading infectious diseases to many different places around the world with little or no notice has significantly increased as international air travel has become commonplace. This threat coupled with increased concerns about possible biological and chemical attacks have resulted in a general increase in the awareness and preparedness of medical personnel to combat these types of threats. Doctors, nurses and emergency medical technicians typically use hazardous material protection suits, commonly known as HAZMAT suits, to protect themselves against these threats. HAZMAT suits completely isolate the healthcare workers from the surrounding environment forming a protective barrier against biological and chemical agents that may be presented by patients being cared for by the healthcare workers.

It has come to my attention during preparedness training for dealing with these threats that it is impossible for medical personnel to use a standard stethoscope when wearing a

HAZMAT suit without compromising the integrity of the suit. Breaking the protective barrier of the HAZMAT suit defeats the purpose of wearing the suit and places medical personnel at risk. There are devices in the prior art that convey auscultatory information gathered by a stethoscope head in ways other than a standard stethoscope, but it has come to my attention that the prior art does not provide a stethoscope device compatible with hazardous material environments.

U.S. Patent No. 6,340,350 issued to Simms discloses an electronic stethoscope and holder comprising a chest piece, an earpiece, and a casing for holding the chest piece and earpiece. The chest piece has a radio wave transmitter for transmitting auscultatory sounds from the chest piece to a receiver in the earpiece. This device could be used to transmit auscultatory sounds from the chest piece through a HAZMAT suit to a receiver within an earpiece worn by the suit wearer. However, this device does not address important concerns that are particular to hazardous material environments such as providing a device that is water tight so that it may be easily decontaminated after use in a hazardous material environment or providing a stethoscope head that is easily used while wearing gloves commonly employed by HAZMAT suits.

U.S. Patent No. 6,544,198 issued to Chong et al. discloses a stethoscope system for self-examination whereby the condition of health of a particular individual can be diagnosed by comparing characteristic sound waves classified by diseases with sound waves generated from various parts of the individual's body. This device could also be used to transmit auscultatory sounds through a HAZMAT suit. However, this system does not provide a self contained and portable stethoscope device that can be used without other support structures in place and does not address the previously mentioned shortcomings that are particular in a hazardous material environment.

Therefore, there is a need for a stethoscope device designed for use by medical personnel wearing HAZMAT suits in hazardous material environments.

SUMMARY OF THE INVENTION

To accomplish the goal of providing a stethoscope device for use in hazardous material environments by personnel wear HAZMAT suits, the claimed invention provides a Cordless Stethoscope for Hazardous Material Environments.

An objective of the claimed invention is to provide a Cordless Stethoscope for Hazardous Material Environments that can cordlessly transmit information from a stethoscope head to a receiver within a hazardous material protection suit.

Another objective of the claimed invention is to provide a Cordless Stethoscope for Hazardous Material Environments having a fluid tight housing holding the stethoscope head and transmitter to allow easy decontamination of the stethoscope head.

A further objective of the claimed invention is to provide a Cordless Stethoscope for Hazardous Material Environments having a housing holding the stethoscope head that is designed to be held by a gloved hand.

An even further objective of the claimed invention is to provide a Cordless Stethoscope for Hazardous Material Environments having a microphone for picking up verbal communications that may not otherwise be audible through a hazardous material protection suit.

To achieve these objectives, as well as others that become apparent after reading this specification and viewing the appended drawings, the claimed invention provides a Cordless Stethoscope for Hazardous Material Environments.

The cordless stethoscope generally comprises a sound sensing device having a stethoscope head and a microphone for sensing and transmitting sounds from a patient, a receiver for receiving the transmissions, and earpieces for converting the received transmissions into audible sound for assessment by the person using the cordless stethoscope.

The sound sensing device comprises a fluid tight housing, a power source, a stethoscope head, a momentary activation switch, a microphone, a microphone activation switch and a transmitter. The sound sensing device is designed to be completely fluid tight so that the device may be decontaminated after use in a hazardous material environment without damaging the inner components of the device. The overall size and shape of the housing allows a user wearing gloves to compensate for the loss of fine motor skills.

The receiver generally comprises a receiver housing, a receiver, a receiver power source, an earpiece jack and a receiver volume control. Several different types of transmitters and receivers may be used in the cordless stethoscope, with magnetic induction transmission and reception being the preferred transmission means.

The cordless stethoscope for hazardous material is used by placing the earpieces within the ears of the user and the receiver within a pocket or cliped onto a belt within the HAZMAT suit worn by the user. The sound sensing device is used by placing the activated device adjacent

a patient's body to gather auscultatory information that is transmitted via the transmitter to the receiver where the signal is converted into audible sound by the earpiece for assessment by the user of the cordless stethoscope.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1. Figure 1 shows a perspective view of the sound sensing device.

Figure 2. Figure 2 shows another perspective view of the sound sensing device.

Figure 3. Figure 3 shows a cross sectional view of the sound sensing device.

Figure 4. Figure 4 shows how the sound sensing device is grasped and used.

Figure 5. Figure 5 shows a cross sectional view of the sound sensing device having an optional microphone.

Figure6. Figure 6 shows a perspective view of the receiver.

Figure 7. Figure 7 shows a cross sectional view of the receiver.

Figure 8. Figure 8 shows a perspective view of the cordless stethoscope packaged as a kit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawing figures, Figure 8 shows the cordless stethoscope for use in hazardous material environments 10. The cordless stethoscope 10 generally comprises a sound sensing device 20 shown in Figures 1-4 having a stethoscope head 30 and a microphone 40 for sensing and transmitting sounds from a patient, a receiver 50 for receiving the transmissions, and earpieces 60 for converting the received transmissions into audible sound for the person using the cordless stethoscope 10.

The sound sensing device 20 shown in Figures 1-4 generally comprises a fluid tight housing 70, a power source 80, a stethoscope head 30, a momentary activation switch 100, a microphone 40, a microphone activation switch 110 and a transmitter 120. The sound sensing device 20 is designed to be completely fluid tight so that the device 20 may be decontaminated after use in a hazardous material environment without damaging the inner components of the device 20.

Heavy gloves are a necessary part of a HAZMAT suit to protect against biological and chemical agents. However, gloves that are commonly used with HAZMAT suits impede the use of fine motor skills involved in handling standard stethoscopes. To alleviate this problem, the fluid tight housing 70 shown in Figures 1-4 has been designed for users wearing gloves 130. The overall size and shape of the housing 70 allows a user wearing gloves130 to compensate for the loss of fine motor skills. Figure 3 shows how the sound sensing device 20 is typically held during use. The housing 70 also has a no slip grip 140 to provide an improved gripping surface

for users wearing heavy gloves and a hand strap ring 150 for attaching the sound sensing device 20 about the hand of the user to prevent possible drop damage to the device 20.

The housing 70 has a head opening 160 for receiving the stethoscope head 30, an activation switch opening 170 for receiving the momentary activation switch 100, a microphone opening 180 for receiving the microphone 40, a microphone switch opening 190 for receiving the microphone switch 110 and an indicator opening 200 for receiving an indicator light 210. The power source 80, preferably a dry cell battery is located within the housing 70.

The stethoscope head 30 shown in Figures 1, 3 and 5 is located within the head opening 160 of the housing 70 and is connected in circuit to the power source 80 and the transmitter 120. The stethoscope head 30 comprises a diaphragm 220 , a stethoscope bell 230, a first fluid tight cover 240, a fluid tight member 250 and a low frequency response microphone 260 for sensing auscultatory sounds created by patient internal biological functions. The fluid tight member 250 between the stethoscope head 30 and the head opening 160 maintains the fluid tight integrity of the housing 70 and provides shock resistance protection to the stethoscope head 30. The indicator light 210 indicates power flow to the stethoscope head 30 when the momentary activation switch100 is actuated.

The momentary activation switch 100 shown in Figures 2, 3 and 5 is situated within the activation switch opening 170 and is connected in circuit to the stethoscope head 30. The low frequency response microphone 260 of the stethoscope head 30 is activated when the momentary activation switch 100 is actuated. A second fluid tight cover 270 is placed over the momentary activation 100 to seal the activation switch opening 170.

The microphone 40 is an optional feature of the sound sensing device 20 as shown in Figure 5. The microphone 40 is used for sensing other communications that may not otherwise be heard by a person wearing a HAZMAT suit. A second fluid tight member 280 between the microphone 40 and the microphone opening 180 maintains the fluid tight integrity of the housing 70. The microphone activation switch 110 is connected in circuit to the microphone 40 for activating the microphone 40. A third fluid tight cover 290 over the microphone switch seals the microphone switch opening 190.

The transmitter 120 shown in Figures 3 and 5 is located within the fluid tight housing 70 and is connected in circuit to the power source 80 for transmitting the first signal and second signal to the receiver 50. The sound sensing device 20 may use several different types of transmitter to effectuate the intended purpose of the cordless stethoscope 10. Preferably, the sound sensing device 20 uses a magnetic induction transmitter to transmit the digital signals to the receiver 50 by way of an omni directional magnetic field. Magnetic induction is preferred over using radio wave transmission due to decreased interference and avoidance of compatibility issues with other medical equipment.

The receiver 50 shown in Figures 6-8 generally comprises a receiver housing 300, a receiver module 310, a receiver power source 320, an earpiece jack 340 and a receiver volume control 350. The receiver module 310 may use several different types of receiver to effectuate the intended purpose of the cordless stethoscope 10. Preferably, the receiver module 310 uses a magnetic induction receiver for receiving the magnetic field transmitted by the magnetic induction transmitter 120.

The earpieces 60 convert the magnetic field transmissions transmitted by the transmitter 120 and received by the receiver module 310 into first and second analog signal that are converted into audible sound for the person using the cordless stethoscope 10 to hear the auscultatory sound and sound communication gathered by the sound sensing device 20. The first and second analog signals may also be cordlessly transmitted from the receiver 50 to the earpieces 60.

The cordless stethoscope for hazardous material environments 10 may be sold in a kit type form as shown in Figure 8 and is used by placing the earpieces 60 within the ears of the user and the receiver 50 within a pocket or clipped onto a belt within the HAZMAT suit worn by the user. The sound sensing device 20 is then used as shown in Figure 4 by placing the activated device 20 adjacent a patient's body to gather auscultatory information that is transmitted via the transmitter 120 to the receiver module 310 where the signal is converted into audible sound by the earpiece for assessment by the user of the cordless stethoscope 10.

Although the invention has been described by reference to some embodiments it is not intended that the novel device be limited thereby, but that modifications thereof are intended to be included as falling within the broad scope and spirit of the foregoing disclosure, the following claims and the appended drawings.